Reduced uncertainty of 30 m North American Boreal Forest Cover

Christopher S.R. Neigh[1], Paul M. Montesano[1,2], K. Jon Ranson[1], Joe Sexton[3], Saurabh Channan[3], Min Feng[3] and John Townshend[3]
[1]Biospheric Sciences Lab., NASA GSFC , [2]Science Systems Applications Inc., [3]University of Maryland College Park, Geog.

Figure 1

Figure 2

Climate warming is expected to alter the distribution of northern forests and a validated high resolution baseline is required to monitor change.

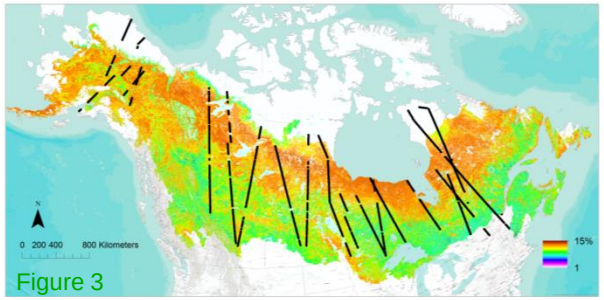

Figure 3

Name: Christopher S.R. Neigh, NASA/GSFC
E-mail: christopher.s.neigh@nasa.gov
Phone: 301-614-6681

References:

2016 Montesano, P.M.; Neigh, C.S.R.; Sexton, J.; Feng, M.; Channan, S.; Ranson, K.J. & Townshend, J.R. Calibration and Validation of Landsat Tree Cover in the Taiga−Tundra Ecotone. *Remote Sensing*, *8*, 551.

2016 Sexton, J.O.; Noojipady, P.; Song, X.P.; Feng, M.; Song, D.X.; Kim, D.H.; Anand, A.; Huang, C.Q.; Channan, S.; Pimm, S.L. & Townshend, J.R. (2016). Conservation policy and the measurement of forests. *Nature Climate Change, 6, 192*-+

1 Sexton, J.O.; Noojipady, P.; Anand, A.; Song, X.P.; McMahon, S.; Huang, C.Q.; Feng, M.; Channan, S. & Townshend, J.R. A model for the propagation of uncertainty from continuous estimates of tree cover to categorical forest cover and change. *Remote Sensing of Environment,* 156:418-425.

Data Sources:

- Multi-resolution passive optical – MODIS, Landsat , and Quickbird-2
- LiDAR – ICESat GLAS and the Portable Airborne Laser Scanner (PALS)

Technical Description of Images: The images show pre and post calibration and validation of Landsat 30 m percent tree canopy cover (%TCC) with the difference.

Figure 1: 2010 calibrated and validated Landsat 30 m %TCC for trees taller than 2 m in height.

Figure 2: Non 2010 calibrated Landsat 30 m %TCC.

Figure 3: Difference of non 2010 calibrated minus 2010 calibrated %TCC overlaid with PALS transects used for calibration.

We found satellite derived %TCC data tended to overestimate tree canopy by up to15% in the northern limit of the North American Boreal forest. This overestimation increased the uncertainty in depictions of forest cover, where small changes may reflect critical site-level drivers of forest dynamics. This work calibrated and validated Landsat-derived TCC dataset using estimates derived from long latitudinal transects of portable airborne laser scanner data.

Scientific significance societal relevance, and relationships to future missions: Forest productivity and ecosystem carbon storage is a critical component of the carbon cycle that sequesters and offsets rising fossil fuel emissions. Northern forests are currently experiencing the greatest amount of warming, responding to climate change, natural disturbances from drought, fire, pests and pathogens etc. and human induced disturbances primarily from fire and harvest. The spatial distribution of forest cover is anticipated to change in coming decades and it is poorly understood across the circumpolar domain because ~80% of the taiga-tundra ecotone is spatially diffuse and clustered in small forest patches that are difficult to discriminate by most Earth observing satellites. Our calibrated and validated estimate of tree cover will provide a baseline estimate to inform analysis of forest cover change and vulnerability in response to climate warming . Combining wall-to-wall remote sensing based estimates of forest cover with Landsat, airborne and spaceborne LiDARs, and sub-meter commercial stereo data verified with field measurements, one could infer aboveground boreal forest carbon stock and change in the Earth's northern forests.